



# MATERIAL SAFETY DATA SHEET

## SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

### **MDL INFORMATION** **SYSTEMS, INC.**

**1281 Murfreesboro Road, Suite  
300**

**Nashville, TN 37217-2423**

**1-615-366-2000**

### **EMERGENCY TELEPHONE NUMBER**

**1-800-424-9300 (NORTH  
AMERICA)**

**1-703-527-3887  
(INTERNATIONAL)**

### **SUBSTANCE: NICKEL**

#### **TRADE NAMES/SYNONYMS:**

**NICKEL ELEMENT; PULVERIZED NICKEL; NICKEL PARTICLES; Ni; OHS16240; RTECS  
QR5950000**

**CHEMICAL FAMILY: metal**

**CREATION DATE: Dec 14 1984**

**REVISION DATE: Sep 16 2002**

## SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

### **COMPONENT: NICKEL**

**CAS NUMBER: 7440-02-0**

**EC NUMBER (EINECS): 231-111-4**

**EC INDEX NUMBER: 028-002-00-7**

**PERCENTAGE: 100**

## SECTION 3 HAZARDS IDENTIFICATION

**NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=0 REACTIVITY=0**

### **EMERGENCY OVERVIEW:**

**COLOR: white to gray**

**PHYSICAL FORM: powder, solid**

**MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, allergic reactions, suspect  
cancer hazard (in animals)**

**PHYSICAL HAZARDS: Negligible fire and explosion hazard in bulk form. Dust/air mixtures may  
ignite or explode.**



**POTENTIAL HEALTH EFFECTS:****INHALATION:**

**SHORT TERM EXPOSURE:** irritation, allergic reactions, difficulty breathing, headache, dizziness, lung congestion, fever

**LONG TERM EXPOSURE:** irritation, lack of sense of smell, cancer

**SKIN CONTACT:**

**SHORT TERM EXPOSURE:** irritation, allergic reactions, skin disorders

**LONG TERM EXPOSURE:** irritation, allergic reactions

**EYE CONTACT:**

**SHORT TERM EXPOSURE:** irritation

**LONG TERM EXPOSURE:** no information is available

**INGESTION:**

**SHORT TERM EXPOSURE:** irritation, headache, dizziness, nausea, vomiting

**LONG TERM EXPOSURE:** no information on significant adverse effects

**CARCINOGEN STATUS:**

**OSHA:** No

**NTP:** Yes

**IARC:** Yes

SECTION 4 FIRST AID MEASURES

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**INHALATION:** If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

**SKIN CONTACT:** Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

**EYE CONTACT:** Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

**INGESTION:** If a large amount is swallowed, get medical attention

SECTION 5 FIRE FIGHTING MEASURES

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**FIRE AND EXPLOSION HAZARDS:** Negligible fire and explosion hazard in bulk form. Dust/air mixtures may ignite or explode.

**EXTINGUISHING MEDIA:** dolomite, dry powder for metal fires, dry sand, graphite, soda ash, sodium chloride

Do not get water directly on material

**FIRE FIGHTING:** Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Use extinguishing agents appropriate for surrounding fire. Avoid inhalation of material or combustion by-products.

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## **SECTION 6**    **ACCIDENTAL RELEASE MEASURES**

### **SOIL RELEASE:**

Dig holding area such as lagoon, pond or pit for containment. Cover with plastic sheet or tarp to minimize spreading and protect from contact with water.

### **WATER RELEASE:**

Trap spilled material at bottom in deep water pockets, excavated holding areas or within sand bag barriers. Remove trapped material with suction hoses. Collect spilled material using mechanical equipment. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

### **OCCUPATIONAL RELEASE:**

Large spills: Collect spilled material in appropriate container for disposal. Avoid generating dust. Clean up residue with a high-efficiency particulate filter vacuum. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

## **SECTION 7**    **HANDLING AND STORAGE**

**STORAGE:** Store and handle in accordance with all current regulations and standards. Store in a tightly closed container. Keep separated from incompatible substances.

## **SECTION 8**    **EXPOSURE CONTROLS, PERSONAL PROTECTION**

### **EXPOSURE LIMITS:**

#### **NICKEL:**

#### **NICKEL, METAL AND INSOLUBLE COMPOUNDS (as Ni):**

1 mg/m<sup>3</sup> OSHA TWA

1.5 mg/m<sup>3</sup> ACGIH TWA (inhalable fraction) (metal)

0.2 mg/m<sup>3</sup> ACGIH TWA (inhalable fraction) (insoluble compounds)

0.015 mg/m<sup>3</sup> NIOSH recommended TWA 10 hour(s)

DFG MAK (airway and skin sensitizer) (inhalable dust fraction) (aerosol)

0.5 mg/m<sup>3</sup> AGS TRK (inhalable fraction) (metal)

1 mg/m<sup>3</sup> UK OES TWA (organic compounds)

3 mg/m<sup>3</sup> UK OES STEL (organic compounds)

0.5 mg/m<sup>3</sup> UK MEL TWA (metal and inorganic compounds) (skin)

**MEASUREMENT METHOD:** Particulate filter; Acid; Inductively coupled plasma; NIOSH IV # 7300, Elements

**VENTILATION:** Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

**EYE PROTECTION:** Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

**CLOTHING:** Wear appropriate chemical resistant clothing

**GLOVES:** Wear appropriate chemical resistant gloves

**RESPIRATOR:** The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

Measurement Element:

Nickel (Ni)

**At any detectable concentration -**

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

**Escape -**

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any appropriate escape-type, self-contained breathing apparatus.

**For Unknown Concentrations or Immediately Dangerous to Life or Health -**

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

## **SECTION 9    PHYSICAL AND CHEMICAL PROPERTIES**

**PHYSICAL STATE:** solid

**APPEARANCE:** lustrous

**COLOR:** white to gray

**PHYSICAL FORM:** powder, solid

**ODOR:** Not available

**MOLECULAR WEIGHT:** 58.69

**MOLECULAR FORMULA:** Ni

**BOILING POINT:** 4946 F (2730 C)

**MELTING POINT:** 2651 F (1455 C)

**VAPOR PRESSURE:** 1 mmHg @ 1810 C

**VAPOR DENSITY:** Not applicable

**SPECIFIC GRAVITY (water=1):** 8.90

**WATER SOLUBILITY:** insoluble

**PH:** Not applicable

**VOLATILITY:** 0%

**ODOR THRESHOLD:** Not available

**EVAPORATION RATE:** Not applicable

**COEFFICIENT OF WATER/OIL DISTRIBUTION:** Not available

**SOLVENT SOLUBILITY:**

**Soluble:** dilute nitric acid

**Slightly Soluble:** hydrochloric acid, sulfuric acid

**Insoluble:** ammonia

## **SECTION 10    STABILITY AND REACTIVITY**

**REACTIVITY:** Stable at normal temperatures and pressure

**CONDITIONS TO AVOID:** None reported

**INCOMPATIBILITIES:** acids, metals, bases, oxidizing materials, halogens, reducing agents, combustible materials

**NICKEL:**

**ACIDS (STRONG):** Possible violent reaction.

**ALUMINUM:** May react explosively on heating.

**AMMONIA:** Possible violent reaction.

**AMMONIUM NITRATE:** Violent or explosive reaction.

**BROMINE PENTAFLUORIDE:** Violent reaction with possible ignition.

**ETHYLENE + ALUMINUM CHLORIDE:** Violent, exothermic reaction.

**DIOXANE:** Explosive reaction above 210 C.

**FLUORINE:** Violent reaction.

**HYDRAZINE:** Vigorous decomposition.

**HYDRAZOIC ACID:** Vigorous decomposition.

**HYDROGEN:** Exothermic above 150 C.

**METHANOL:** Possible ignition.

**NITRIC ACID:** Attacks.

**NITRYL FLUORIDE:** Incandescence on warming.

**ORGANIC SOLVENTS:** Possible explosion on heating.

**OXIDANTS:** Violent reaction.

**PERFORMIC ACID:** Violent reaction.

**PHOSPHORUS:** Incandescence on heating.

**POTASSIUM PERCHLORATE, TITANIUM, AND INFUSORIAL EARTH:** Shock-sensitive mixture.

**SELENIUM:** Incandescent reaction with heating.

**SULFUR AND COMPOUNDS:** Incandescent reaction with heating.

**HAZARDOUS DECOMPOSITION:**

Thermal decomposition products: nickel compounds

**POLYMERIZATION:** Will not polymerize

**SECTION 1 TOXICOLOGICAL INFORMATION**

**NICKEL:**

**TOXICITY DATA:**

5 gm/kg oral-rat LDLo; 250 mg/kg intraperitoneal-rat LD50; 12 mg/kg intratracheal-rat LDLo; 50 mg/kg intravenous-mouse LDLo; 12500 ug/kg subcutaneous-cat LDLo; 7 mg/kg intraperitoneal-rabbit LDLo; 7500 ug/kg subcutaneous-rabbit LDLo; 5 mg/kg oral-guinea pig LDLo; 500 mg/kg/5 day(s) intermittent oral-rat TDLo; 100 ug/m3/24 hour(s)-17 week(s) continuous inhalation-rat TCLo; 50 mg/kg/5 day(s) intermittent intravenous-rat TDLo; 500 mg/kg/5 day(s) intermittent oral-mouse TDLo; 100 mg/kg/5 day(s) intermittent intravenous-mouse TDLo; 1700 ug/m3/6 hour(s)-5 week(s) intermittent inhalation-rabbit TCLo; 130 ug/m3/6 hour(s)-35 week(s) intermittent inhalation-rabbit TCLo; 1 mg/m3/6 hour(s)-26 week(s) intermittent inhalation-rabbit TCLo; 1 mg/m3/6 hour(s)-13 week(s) intermittent inhalation-rabbit TCLo; 50 mg/kg/5 day(s) intermittent intravenous-rabbit TDLo

**CARCINOGEN STATUS:** NTP: Anticipated Human Carcinogen; IARC: Human Inadequate Evidence, Animal Sufficient Evidence, Group 2B (Nickel); ACGIH: A5 -Not Suspected as a Human Carcinogen metal; TRGS 905: K 3

Metallic nickel was tested by inhalation exposure in mice, rats and guinea-pigs, by intratracheal instillation in rats, by intramuscular injection in rats and hamsters, and by intrapleural, subcutaneous, intraperitoneal and intrarenal injection in rats. The studies by inhalation exposure were inadequate for an assessment of carcinogenicity. After intratracheal instillation, it produced significant numbers of squamous-cell carcinomas and adenocarcinomas of the lung. Intrapleural injections induced sarcomas in rats. Subcutaneous administration of metallic nickel pellets induced sarcomas in rats, intramuscular injection of nickel powder induced sarcomas in rats and hamsters, and intraperitoneal injections induced carcinomas and sarcomas in rats. There is inadequate evidence in humans and limited evidence in experimental animals for the carcinogenicity of nickel alloys. A ferronickel alloy did not induce local tumors after intramuscular or intrarenal injection in rats. Two powdered nickel alloys induced malignant tumors following intraperitoneal injection in rats, and one nickel alloy induced sarcomas following subcutaneous implantation of pellets in rats.

**LOCAL EFFECTS:**

Irritant: inhalation, skin

**ACUTE TOXICITY LEVEL:** Insufficient Data.

**TARGET ORGANS:** immune system (sensitizer)

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** immune system disorders or allergies, respiratory disorders, skin disorders and allergies

**TUMORIGENIC DATA:**

3000 mg/kg subcutaneous-rat TDLo/6 week(s) intermittent; 56 mg/kg intramuscular-rat TDLo; 100 mg/kg intrapleural-rat TDLo/21 week(s) intermittent; 40 mg/kg parenteral-rat TDLo/52 week(s) intermittent; 250 mg/kg implant-rat TDLo; 200 mg/kg intramuscular-mouse TDLo; 165 mg/kg implant-rabbit TDLo/2 year(s) intermittent; 15 mg/m<sup>3</sup> inhalation-guinea pig TCLo/91 week(s) intermittent; 200 mg/kg intramuscular-hamster TDLo/21 week(s) intermittent; 58 mg/kg intramuscular-rat TD; 23 mg/kg implant-rat TD; 125 mg/kg intramuscular-rat TD/13 week(s) intermittent; 800 mg/kg intramuscular-mouse TD/13 week(s) intermittent; 90 mg/kg intramuscular-rat TD/18 week(s) intermittent; 889 ug/kg intramuscular-rat TD; 1250 mg/kg intrapleural-rat TD/17 week(s) intermittent; 125 mg/kg intrapleural-rat TD/21 week(s) intermittent; 200 mg/kg intramuscular-rat TD/21 week(s) intermittent; 1 gm/kg intramuscular-rat TD/17 week(s) intermittent

**MUTAGENIC DATA:**

morphological transformation - hamster kidney 400 mg/L; morphological transformation - hamster embryo 5 umol/L

**REPRODUCTIVE EFFECTS DATA:**

158 mg/kg oral-rat TDLo multigenerations

**HEALTH EFFECTS:****INHALATION:****ACUTE EXPOSURE:**

**NICKEL:** May cause respiratory irritation, cough, pneumonitis and fever. Overexposure may cause headache, dizziness, and difficult breathing. Pulmonary edema may be a delayed symptom. Pulmonary sensitization may occur causing eosinophilic pneumonitis, asthma and host rejection of nickel containing prostheses. Two workers experienced severe but transient pneumonitis after being exposed to 0.26 mg/m<sup>3</sup> for six hours.

**CHRONIC EXPOSURE:**

**NICKEL:** Repeated or prolonged inhalation may cause mucous membrane irritation and pulmonary sensitization. Workers exposed to nickel dust frequently developed chronic hypertrophic rhinitis and nasal sinusitis. Anosmia, nasal polyposis and perforation of the nasal septum may also occur. Rabbits exposed to 1 mg/m<sup>3</sup> dust for 6 hours per day, five days a week for up to six months showed two- to three- fold increases in the volume density of alveolar type II cells. The six-month exposure caused focal pneumonia. Rats injected intratracheally once a week with 0.9 mg for ten weeks or 0.3 mg for 20 weeks showed adenocarcinomas, squamous-cell carcinomas, one adenoma and one mixed tumor.

**SKIN CONTACT:**

**ACUTE EXPOSURE:**

**NICKEL:** May cause irritation. Skin sensitization may occur in previously exposed individuals. "Nickel itch", a type of dermatitis resulting from sensitization to nickel may begin with a sensation of burning and itching at the place of contact and usually occurs seven days before the characteristic skin eruptions appear. The primary skin eruption is erythematous or follicular; it may be followed by superficial discrete ulcers which discharge and become crusted. The eruption may spread to areas related to the activity of the primary site. Pigmented or depigmented plaques may be formed. This sensitization reaction may be accompanied by fever, stomatitis, gingivitis, conjunctivitis, paroxysmal asthmatic attacks and eosinophilic pneumonitis. Recovery usually occurs within 7 days after exposure. Nickel is not absorbed through the unbroken skin in amounts sufficient to cause intoxication.

**CHRONIC EXPOSURE:**

**NICKEL:** Repeated or prolonged skin contact may cause sensitization dermatitis

**EYE CONTACT:**

**ACUTE EXPOSURE:**

**NICKEL:** Dust may be irritating to the eyes.

**CHRONIC EXPOSURE:**

**NICKEL:** No data available.

**INGESTION:**

**ACUTE EXPOSURE:**

**NICKEL:** Insoluble nickel compounds have a low level of toxicity due to poor absorption from the gastrointestinal tract. Overexposure may cause headache, nausea, vomiting, dizziness, and gastrointestinal irritation.

**CHRONIC EXPOSURE:**

**NICKEL:** Reproductive effects have been reported in animals.

## SECTION 12 ECOLOGICAL INFORMATION

**ECOTOXICITY DATA:**

**FISH TOXICITY:** 8000 ug/L 96 hour(s) LC50 (Mortality) Pumpkinseed (*Lepomis gibbosus*)

**INVERTEBRATE TOXICITY:** 8850 ug/L 48 hour(s) LC50 (Mortality) Greasyback shrimp (*Metapenaeus ensis*)

**ALGAL TOXICITY:** 1000 ug/L 72 hour(s) (Physiological) Blue-green algae (*Nostoc muscorum*)

**PHYTOTOXICITY:** 450 ug/L 4 hour(s) EC50 (Growth) Duckweed (*Lemna minor*)

## SECTION 13 DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations.

## SECTION 14 TRANSPORT INFORMATION

**U.S. DEPARTMENT OF TRANSPORTATION:** No classification assigned

**CANADIAN TRANSPORTATION OF DANGEROUS GOODS:** No classification assigned.

**LAND TRANSPORT ADR/RID:** No classification assigned.

**AIR TRANSPORT IATA/ICAO:** No classification assigned.

**MARITIME TRANSPORT IMDG:** No classification assigned

## SECTION 15 REGULATORY INFORMATION

### U.S. REGULATIONS:

**CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):**

**NICKEL:** 100 LBS RQ

**SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):**  
Not regulated.

**SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):**  
Not regulated.

**SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):**

ACUTE: Yes

CHRONIC: Yes

FIRE: No

REACTIVE: No

SUDDEN RELEASE: No

**SARA TITLE III SECTION 313 (40 CFR 372.65):**  
**NICKEL**

**OSHA PROCESS SAFETY (29CFR1910.119):** Not regulated.

### STATE REGULATIONS:

**California Proposition 65:**

Known to the state of California to cause the following:

**NICKEL**

Cancer (Oct 01, 1989)

**NICKEL (refinery dust from the pyrometallurgical process)**

Cancer (Oct 01, 1987)

### CANADIAN REGULATIONS:

**WHMIS CLASSIFICATION:** Not determined.

### EUROPEAN REGULATIONS:

**EC CLASSIFICATION (ASSIGNED):**

<input type="checkbox"/>	Sensitizing
<input type="checkbox"/>	Carcinogen Category 3

EC Classification may be inconsistent with independently-researched data.

**DANGER/HAZARD SYMBOL:****EC RISK AND SAFETY PHRASES:**

R 40	Limited evidence of a carcinogenic effect.
R 43	May cause sensitization by skin contact.
S 2	Keep out of reach of children.
S 22	Do not breathe dust.
S 36	Wear suitable protective clothing.

**GERMAN REGULATIONS:****WATER HAZARD CLASS (WGK):****STATE OF CLASSIFICATION:** VwVwS**CLASSIFICATION UNDER HAZARD TO WATER:** 0**NATIONAL INVENTORY STATUS:****U.S. INVENTORY (TSCA):** Listed on inventory**TSCA 12(b) EXPORT NOTIFICATION:** Not listed.**SECTION 16** OTHER INFORMATION**MSDS SUMMARY OF CHANGES****SECTION 1** CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**SECTION 2** COMPOSITION, INFORMATION ON INGREDIENTS**SECTION 3** HAZARDS IDENTIFICATION**SECTION 8** EXPOSURE CONTROLS, PERSONAL PROTECTION**SECTION 9** PHYSICAL AND CHEMICAL PROPERTIES

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### MDL INFORMATION SYSTEMS, INC.

1281 Murfreesboro Road, Suite  
300

Nashville, TN 37217-2423

1-615-366-2000

### EMERGENCY TELEPHONE NUMBER

1-800-424-9300 (NORTH  
AMERICA)

1-703-527-3887  
(INTERNATIONAL)

### SUBSTANCE: SELENIUM

#### TRADE NAMES/SYNONYMS:

SELENIUM ELEMENT; C.I. 77805; SELENIUM, METALLIC; SELENIUM METAL; SELENIUM,  
ELEMENTAL; Se; OHS20500; RTECS VS7700000

**CHEMICAL FAMILY:** non-metallic

**CREATION DATE:** Mar 25 1985

**REVISION DATE:** Sep 16 2002

## SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

### COMPONENT: SELENIUM

**CAS NUMBER:** 7782-49-2

**EC NUMBER (EINECS):** 231-957-4

**EC INDEX NUMBER:** 034-001-00-2

**PERCENTAGE:** 100

## SECTION 3 HAZARDS IDENTIFICATION

**NFPA RATINGS (SCALE 0-4):** HEALTH=2 FIRE=0 REACTIVITY=0

### EMERGENCY OVERVIEW:

**COLOR:** red, gray or black

**PHYSICAL FORM:** solid

**ODOR:** odorless

**MAJOR HEALTH HAZARDS:** respiratory tract irritation, skin irritation, eye irritation

### POTENTIAL HEALTH EFFECTS:



**INHALATION:**

**SHORT TERM EXPOSURE:** irritation, nosebleed, lack of sense of smell, metal fume fever, headache, lung congestion

**LONG TERM EXPOSURE:** irritation, nausea, vomiting, diarrhea, fatigue, emotional disturbances, kidney damage

**SKIN CONTACT:**

**SHORT TERM EXPOSURE:** irritation

**LONG TERM EXPOSURE:** irritation

**EYE CONTACT:**

**SHORT TERM EXPOSURE:** irritation (possibly severe)

**LONG TERM EXPOSURE:** irritation

**INGESTION:**

**SHORT TERM EXPOSURE:** nausea, vomiting, diarrhea

**LONG TERM EXPOSURE:** same as effects reported in long term inhalation, skin disorders

**CARCINOGEN STATUS:**

**OSHA:** No

**NTP:** No

**IARC:** No

**SECTION 4 FIRST AID MEASURES**

**INHALATION:** If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

**SKIN CONTACT:** Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing and shoes before reuse. Destroy contaminated shoes.

**EYE CONTACT:** Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

**INGESTION:** If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

**NOTE TO PHYSICIAN:** For inhalation, consider oxygen. For ingestion, consider gastric lavage and catharsis. Consider oxygen.

**SECTION 5 FIRE FIGHTING MEASURES**

**FIRE AND EXPLOSION HAZARDS:** Negligible fire hazard.

**EXTINGUISHING MEDIA:** regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

**FIRE FIGHTING:** Move container from fire area if it can be done without risk. Do not attempt to extinguish fire unless flow of material can be stopped first. Use extinguishing agents appropriate for surrounding fire. Flood with fine water spray. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or

combustion by-products. Stay upwind and keep out of low areas. Consider downwind evacuation if material is leaking.

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## **SECTION 6**    **ACCIDENTAL RELEASE MEASURES**

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### **OCCUPATIONAL RELEASE:**

Do not touch spilled material. Stop leak if possible without personal risk. Small spills: Absorb with sand or other non-combustible material. Collect with absorbent into suitable container. Small dry spills: Collect spilled material in appropriate container for disposal. Move containers away from spill to a safe area. Large spills: Dike for later disposal. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

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## **SECTION 7**    **HANDLING AND STORAGE**

**STORAGE:** Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances.

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## **SECTION 8**    **EXPOSURE CONTROLS, PERSONAL PROTECTION**

### **EXPOSURE LIMITS:**

#### **SELENIUM:**

#### **SELENIUM AND COMPOUNDS (as Se):**

0.2 mg/m<sup>3</sup> OSHA TWA

0.2 mg/m<sup>3</sup> ACGIH TWA

0.2 mg/m<sup>3</sup> NIOSH recommended TWA 10 hour(s)

0.05 mg/m<sup>3</sup> DFG MAK (peak limitation category-II,1, with excursion factor of 4) (inhalable dust fraction) (metal and inorganic compounds)

0.1 mg(Se)/m<sup>3</sup> UK OES TWA

**MEASUREMENT METHOD:** Particulate filter; Acid; Inductively coupled plasma; NIOSH IV # 7300, Elements; ALSO II(7) # S190

**VENTILATION:** Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

**EYE PROTECTION:** Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

**CLOTHING:** Wear appropriate chemical resistant clothing.

**GLOVES:** Wear appropriate chemical resistant gloves.

**RESPIRATOR:** The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.  
Measurement Element:

Selenium (Se)

**1 mg/m<sup>3</sup>**

Any dust and mist respirator.

Any dust, mist, and fume respirator.

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any powered, air-purifying respirator with a dust and mist filter.

Any powered, air-purifying respirator with a dust, mist, and fume filter.

Any supplied-air respirator.

Any self-contained breathing apparatus with a full facepiece.

**Escape -**

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any appropriate escape-type, self-contained breathing apparatus.

**For Unknown Concentrations or Immediately Dangerous to Life or Health -**

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

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## **SECTION 9    PHYSICAL AND CHEMICAL PROPERTIES**

**PHYSICAL STATE:** solid

**COLOR:** red, gray or black

**ODOR:** odorless

**MOLECULAR WEIGHT:** 78.96

**MOLECULAR FORMULA:** Se

**BOILING POINT:** 1261-1265 F (683-685 C)

**MELTING POINT:** 423 F (217 C)

**VAPOR PRESSURE:** 10 mmHg @ 429 C

**VAPOR DENSITY:** Not applicable

**SPECIFIC GRAVITY (water=1):** 4.81

**WATER SOLUBILITY:** insoluble

**PH:** Not applicable

**VOLATILITY:** Not applicable

**ODOR THRESHOLD:** Not available

**EVAPORATION RATE:** Not applicable

**VISCOSITY:** 221 cP @ 220 C

**COEFFICIENT OF WATER/OIL DISTRIBUTION:** Not available

**SOLVENT SOLUBILITY:**

**Soluble:** sulfuric acid, chloroform, methylene iodide, benzene, quinoline, nitric acid, ether, alkali solutions, selenium oxychloride

**Very Slightly Soluble:** carbon disulfide

**Insoluble:** alcohol

## **SECTION 10    STABILITY AND REACTIVITY**

**REACTIVITY:** Stable at normal temperatures and pressure.

**CONDITIONS TO AVOID:** Avoid heat, flames, sparks and other sources of ignition. Avoid generating dust. Keep out of water supplies and sewers.

**INCOMPATIBILITIES:** combustible materials, oxidizing materials, halogens, metals, metal carbide,

metal salts, metal oxides, bases

**SELENIUM:**

**ALKALI METAL AMIDES:** Produces explosive products.

**ALKALINE EARTH METAL AMIDES:** Produces explosive products.

**BARIUM PEROXIDE:** Ignites at 265 C.

**BROMINE PENTAFLUORIDE:** Violent reaction and possible ignition.

**CADMIUM:** Possible explosion when heated.

**CHLORINE TRIFLUORIDE:** Reacts violently, ignition often occurring.

**CHROMIC ANHYDRIDE:** Violent reaction.

**FLUORINE:** Ignites on contact.

**LITHIUM SILICIDE:** Incandescent reaction.

**METAL ACETYLIDES:** Incandescent reaction on heating.

**METAL CARBIDES:** Incandescent reaction on heating.

**METAL CHLORATES (EXCEPT ALKALI):** Incandescent reaction in the presence of water.

**METALS:** Contact of many metals with selenium results in incandescence.

**NITROGEN TRICHLORIDE:** Explodes on contact.

**ORGANIC MATERIALS + OXYGEN:** May result in explosive oxidation.

**OXIDIZERS (STRONG):** Fire and explosion hazard.

**PHOSPHORUS:** Incandescent reaction when heated.

**POTASSIUM:** Incandescence reaction with possible explosion.

**POTASSIUM BROMATE:** Violent, explosive reaction.

**SILVER BROMATE:** Violent explosive reaction.

**SILVER OXIDE:** Ignition on grinding.

**SODIUM PEROXIDE:** Forms explosive mixture.

**TIN (POWDERED):** Extremely exothermic, incandescent reaction.

**ZINC:** Possible explosion on heating.

**HAZARDOUS DECOMPOSITION:**

Thermal decomposition products: selenium

**POLYMERIZATION:** Will not polymerize.

**SECTION 11 TOXICOLOGICAL INFORMATION****SELENIUM:****TOXICITY DATA:**

6700 mg/kg oral-rat LD50; 33 mg/m<sup>3</sup>/8 hour(s) inhalation-rat LCLo; 6 mg/kg intravenous-rat LD50; 2500 ug/kg intravenous-rabbit LDLo

**CARCINOGEN STATUS:** IARC: Human Inadequate Evidence, Animal Inadequate Evidence, Group 3

**LOCAL EFFECTS:**

Irritant: inhalation, skin, eye

**ACUTE TOXICITY LEVEL:**

Slightly Toxic: ingestion

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** gastrointestinal disorders, immune system disorders or allergies, kidney disorders, liver disorders, respiratory disorders, skin disorders and allergies

**TUMORIGENIC DATA:**

480 mg/kg oral-mouse TDLo/60 day(s) continuous

**REPRODUCTIVE EFFECTS DATA:**

134 mg/kg oral-mouse TDLo multigenerations

**HEALTH EFFECTS:****INHALATION:****ACUTE EXPOSURE:**

**SELENIUM:** Inhalation may cause irritation of the upper respiratory tract with sneezing and coughing. Dust of metallic selenium may collect in the nostrils and produce catarrh, anosmia, and epistaxis. Exposure to selenium dust at air concentrations of 33 mg/m<sup>3</sup> for 8 hours resulted in death in 10% of the rats tested. The major pathologic finding was interstitial pneumonitis. A brief exposure to high concentrations of fume produced severe irritation of the nose and throat followed by headache in exposed workers. One case of transient dyspnea was reported. Large quantities of fume may produce pulmonary edema within 1 to 4 hours after exposure. Metal fume fever, an influenza-like illness, may occur due to the inhalation of freshly formed metal oxide particles sized below 1.5 microns and usually between 0.02-0.05 microns. Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur. Tolerance to fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours.

**CHRONIC EXPOSURE:**

**SELENIUM:** Repeated or prolonged exposure has been reported to cause a metallic taste in the mouth, a garlic odor of the breath and sweat, bronchial and nasopharyngeal irritation, pallor, coated tongue, nervousness, depression, fatigue, vestibulotoxicity and gastrointestinal disturbances. Liver injury has been produced in experimental animals. Selenium compounds may affect the kidneys.

**SKIN CONTACT:****ACUTE EXPOSURE:**

**SELENIUM:** Contact with dust or fumes may cause irritation.

**CHRONIC EXPOSURE:**

**SELENIUM:** Repeated or prolonged exposure may cause dermatitis.

**EYE CONTACT:****ACUTE EXPOSURE:**

**SELENIUM:** High concentrations of fume may cause severe irritation.

**CHRONIC EXPOSURE:**

**SELENIUM:** Repeated or prolonged exposure to irritants may cause conjunctivitis.

**INGESTION:****ACUTE EXPOSURE:**

**SELENIUM:** Elemental selenium is poorly absorbed from the gastrointestinal tract. Ingestion of selenium compounds may cause severe irritation and disturbances of the gastrointestinal tract and a metallic taste in the mouth.

**CHRONIC EXPOSURE:**

**SELENIUM:** Repeated or prolonged ingestion may cause effects similar to those as detailed in chronic inhalation. In addition, symptoms may include partial loss of hair and nail changes. Additional data reported in animals includes anemia, liver, kidney and heart damage, sterility and congenital defects.

## SECTION 12 ECOLOGICAL INFORMATION

### **ECOTOXICITY DATA:**

**FISH TOXICITY:** 1000 ug/L 96 hour(s) LC50 (Mortality) Fathead minnow (*Pimephales promelas*)

**INVERTEBRATE TOXICITY:** 115 ug/L 21 hour(s) MATC (Growth) Water flea (*Daphnia magna*)

**ALGAL TOXICITY:** 7930 ug/L 96 hour(s) EC50 (Photosynthesis) Diatom (*Skeletonema costatum*)

**PHYTOTOXICITY:** 2400 ug/L 4 hour(s) EC50 (Growth) Duckweed (*Lemna minor*)

### **FATE AND TRANSPORT:**

**BIOCONCENTRATION:** 322 ug/L 21 hour(s) BCF (Residue) Water flea (*Daphnia magna*) 5 ug/L

## SECTION 13 DISPOSAL CONSIDERATIONS

Recycle if possible. Hazardous Waste Number(s): D010. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 1.0 mg/L. Dispose in accordance with all applicable regulations.

## SECTION 14 TRANSPORT INFORMATION

**U.S. DEPARTMENT OF TRANSPORTATION:** No classification assigned.

**CANADIAN TRANSPORTATION OF DANGEROUS GOODS:** No classification assigned.

**LAND TRANSPORT ADR/RID:** No classification assigned.

**AIR TRANSPORT IATA/ICAO:** No classification assigned.

**MARITIME TRANSPORT IMDG:** No classification assigned.

## SECTION 15 REGULATORY INFORMATION

### **U.S. REGULATIONS:**

**CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):**

**SELENIUM:** 100 LBS RQ

**SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):**  
Not regulated.

**SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):**  
Not regulated.

**SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):**

**ACUTE:** Yes

**CHRONIC:** No

**FIRE:** No  
**REACTIVE:** No  
**SUDDEN RELEASE:** No

**SARA TITLE III SECTION 313 (40 CFR 372.65):**  
**SELENIUM AND COMPOUNDS (as Se)**

**OSHA PROCESS SAFETY (29CFR1910.119):** Not regulated

**STATE REGULATIONS:**  
**California Proposition 65:** Not regulated.

**CANADIAN REGULATIONS:**  
**WHMIS CLASSIFICATION:** Not determined

**EUROPEAN REGULATIONS:**  
**EC CLASSIFICATION (ASSIGNED):**

T	Toxic
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EC Classification may be inconsistent with independently-researched data.

**DANGER/HAZARD SYMBOL:**



**EC RISK AND SAFETY PHRASES:**

R 23/25	Toxic by inhalation and if swallowed.
R 33	Danger of cumulative effects.
R 53	May cause long-term adverse effects in the aquatic environment.
S 1/2	Keep locked-up and out of reach of children.
S 20/21	When using, do not eat, drink or smoke.
S 28	After contact with skin, wash immediately with plenty of soap and water.
S 45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 61	Avoid release to the environment. Refer to special instructions/Safety data sheets.

**GERMAN REGULATIONS:**  
**WATER HAZARD CLASS (WGK):**  
**STATE OF CLASSIFICATION:** Annex 3  
**CLASSIFICATION UNDER HAZARD TO WATER:** 2

**NATIONAL INVENTORY STATUS:**  
**U.S. INVENTORY (TSCA):** Listed on inventory.

**TSCA 12(b) EXPORT NOTIFICATION:** Not listed.

## SECTION 16 OTHER INFORMATION

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**MSDS SUMMARY OF CHANGES**

**SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION**

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# MATERIAL SAFETY DATA SHEET

## SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

### MDL INFORMATION SYSTEMS, INC.

1281 Murfreesboro Road, Suite  
300

Nashville, TN 37217-2423

1-615-366-2000

### EMERGENCY TELEPHONE NUMBER

1-800-424-9300 (NORTH  
AMERICA)

1-703-527-3887  
(INTERNATIONAL)

### SUBSTANCE: SILVER

#### TRADE NAMES/SYNONYMS:

ALGAEDYN; ARGENTUM; C.I. 77820; E 20; L 3; SHELL SILVER; SILFLAKE 135; SILPOWDER 130; SILVER ATOM; SILVER ELEMENT; SILVER METAL; SILVEST TCG 1; SR 999; TCG 7R; V 9; XA 208; S-163,S-166,S-167; FSP, FSF, FS CRYSTAL, FSS, FSW, FS SHOT, FS ANODES (METZ METALLURGICAL CORPORATION); AG; OHS20770; RTECS VW3500000

CHEMICAL FAMILY: metal

CREATION DATE: Dec 31 1984

REVISION DATE: Sep 16 2002

## SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: SILVER

CAS NUMBER: 7440-22-4

EC NUMBER (EINECS): 231-131-3

PERCENTAGE: 100.0

## SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=1 FIRE=3 REACTIVITY=0

### EMERGENCY OVERVIEW:

COLOR: white

PHYSICAL FORM: solid

MAJOR HEALTH HAZARDS: No significant target effects reported.

PHYSICAL HAZARDS: Flammable solid. Negligible fire and explosion hazard in bulk form. Dust/air mixtures may ignite or explode.



**POTENTIAL HEALTH EFFECTS:****INHALATION:****SHORT TERM EXPOSURE:** no information on significant adverse effects**LONG TERM EXPOSURE:** no information on significant adverse effects**SKIN CONTACT:****SHORT TERM EXPOSURE:** no information on significant adverse effects**LONG TERM EXPOSURE:** no information on significant adverse effects**EYE CONTACT:****SHORT TERM EXPOSURE:** no information on significant adverse effects**LONG TERM EXPOSURE:** no information on significant adverse effects**INGESTION:****SHORT TERM EXPOSURE:** no information on significant adverse effects**LONG TERM EXPOSURE:** no information is available**CARCINOGEN STATUS:****OSHA:** No**NTP:** No**IARC:** NoSECTION 4 FIRST AID MEASURES

**INHALATION:** If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

**SKIN CONTACT:** Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

**EYE CONTACT:** Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

**INGESTION:** If a large amount is swallowed, get medical attention.

SECTION 5 FIRE FIGHTING MEASURES

**FIRE AND EXPLOSION HAZARDS:** Negligible fire and explosion hazard in bulk form. Dust/air mixtures may ignite or explode.

**EXTINGUISHING MEDIA:** dolomite, dry powder for metal fires, dry sand, graphite, soda ash, sodium chloride

Do not get water directly on material

**FIRE FIGHTING:** Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Use extinguishing agents appropriate for surrounding fire. Avoid inhalation of material or combustion by-products.

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## SECTION 6 ACCIDENTAL RELEASE MEASURES

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### **OCCUPATIONAL RELEASE:**

Large spills: Collect spilled material in appropriate container for disposal. Avoid generating dust. Clean up residue with a high-efficiency particulate filter vacuum. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

---

## SECTION 7 HANDLING AND STORAGE

**STORAGE:** Store and handle in accordance with all current regulations and standards. Store in a cool, dry place. Keep separated from incompatible substances.

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## SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

### **EXPOSURE LIMITS:**

#### **SILVER:**

#### **SILVER, METAL (as Ag):**

0.01 mg/m<sup>3</sup> OSHA TWA

0.1 mg/m<sup>3</sup> ACGIH TWA

0.01 mg/m<sup>3</sup> NIOSH recommended TWA 10 hour(s)

0.1 mg/m<sup>3</sup> DFG MAK (peak limitation category-III) (inhalable dust fraction)

0.1 mg/m<sup>3</sup> EC OEL TWA

0.1 mg/m<sup>3</sup> UK OES TWA

**MEASUREMENT METHOD:** Particulate filter; Acid; Inductively coupled plasma; NIOSH IV # 7300, Elements

**VENTILATION:** Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

**EYE PROTECTION:** Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

**CLOTHING:** Wear appropriate chemical resistant clothing.

**GLOVES:** Wear appropriate chemical resistant gloves.

**RESPIRATOR:** The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

Measurement Element:

Silver (Ag)

**0.25 mg/m<sup>3</sup>**

Any supplied-air respirator operated in a continuous-flow mode.

Any powered, air-purifying respirator with a high-efficiency particulate filter.

**0.5 mg/m<sup>3</sup>**

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any self-contained breathing apparatus with a full facepiece.

Any supplied-air respirator with a full facepiece.

**10.0 mg/m<sup>3</sup>**

Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode.

**Escape -**

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any appropriate escape-type, self-contained breathing apparatus.

**For Unknown Concentrations or Immediately Dangerous to Life or Health -**

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

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## SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

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**PHYSICAL STATE:** solid

**APPEARANCE:** lustrous

**COLOR:** white

**ODOR:** Not available

**MOLECULAR WEIGHT:** 107.868

**MOLECULAR FORMULA:** AG

**BOILING POINT:** 3852 F (2122 C)

**MELTING POINT:** 1764 F (962 C)

**VAPOR PRESSURE:** 100 mmHg @ 1865 C

**VAPOR DENSITY:** Not applicable

**SPECIFIC GRAVITY (water=1):** 10.5

**WATER SOLUBILITY:** insoluble

**PH:** Not applicable

**VOLATILITY:** Not applicable

**ODOR THRESHOLD:** Not available

**EVAPORATION RATE:** Not applicable

**COEFFICIENT OF WATER/OIL DISTRIBUTION:** Not available

**SOLVENT SOLUBILITY:**

**Soluble:** nitric acid, hot sulfuric acid, potassium cyanide solutions, alkali hydroxide solutions, alkali cyanide solutions

**Insoluble:** alkali

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## SECTION 10 STABILITY AND REACTIVITY

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**REACTIVITY:** Stable at normal temperatures and pressure.

**CONDITIONS TO AVOID:** Avoid generating dust. Avoid heat, flames, sparks and other sources of ignition.

**INCOMPATIBILITIES:** combustible materials, bases, halo carbons, halogens, peroxides, acids, oxidizing materials

**SILVER:**

**ACETYLENE (AND COMPOUNDS):** Forms explosive silver acetylide.

AMMONIA: Forms explosive compounds.  
AZIRIDINE: Formation of explosive compounds.  
BROMOAZIDE: Probable explosion.  
1-BROMO-2-PROPYLENE: Explosion hazard.  
CARBON: Reacts violently.  
CHLORINE TRIFLUORIDE: Possible ignition.  
ETHYLENEIMINE: Forms explosive compound.  
ETHYLENE OXIDE + TRACES OF ACETYLENE: May form explosive silver acetylide.  
ETHYL HYDROPEROXIDE: Explosion hazard.  
HYDROGEN PEROXIDE: Ignition or violent decomposition.  
IODOFORM: Reacts with incandescence.  
NITRIC ACID + ETHYL ALCOHOL: Forms explosive compounds.  
OXALIC ACID: Forms explosive compound.  
OZONIDES: Decomposed, possibly explosively.  
PERMONOSULFURIC ACID: Explosive decomposition.  
PEROXYFORMIC ACID: Reacts explosively.  
SULFURIC ACID: Reacts violently.  
TARTARIC ACID: Formation of explosive salt.  
ZINC + ELECTROLYTES: Possible spontaneous ignition.

**HAZARDOUS DECOMPOSITION:**

Thermal decomposition products: miscellaneous decomposition products

**POLYMERIZATION:** Will not polymerize.

---

**SECTION 11 TOXICOLOGICAL INFORMATION****SILVER:****TOXICITY DATA:**

>10 gm/kg oral-mouse LD; >5 gm/kg oral-guinea pig LD

**TUMORIGENIC DATA:**

330 mg/kg multiple-rat TDLo/43 week(s) intermittent; 2400 mg/kg implant-rat TDLo; 1 gm/kg implant-mouse TDLo; 2570 mg/kg implant-rat TD

**HEALTH EFFECTS:****INHALATION:****ACUTE EXPOSURE:**

SILVER: Impregnation of the mucous membranes by fine particles of metallic silver may cause localized argyria.

**CHRONIC EXPOSURE:**

SILVER: Repeated or prolonged exposure (2-25 years) to silver dusts may cause a permanent localized blue-grey discoloration of the skin, mucous membranes, and eyes (argyria), without evidence of tissue reaction. Discoloration is first apparent in the conjunctiva, with some localization in the inner canthus. In severe cases, the skin may become black with a metallic luster and the eyes may be affected to the point that the lens and vision are disturbed. The respiratory tract may also be affected producing a mild chronic bronchitis.

**SKIN CONTACT:****ACUTE EXPOSURE:**

SILVER: Impregnation of the skin by fine particles of metallic silver may cause localized argyria.

**CHRONIC EXPOSURE:**

SILVER: Repeated or prolonged exposure to silver dust may cause localized argyria.

**EYE CONTACT:****ACUTE EXPOSURE:**

SILVER: Contact with silver dust may cause localized argyria. Application of small particles of metallic silver in the anterior chamber of rabbit eyes caused little reaction; caused atrophic changes in the retina when placed in the vitreous; and reacted with surrounding tissue when placed in the cornea.

**CHRONIC EXPOSURE:**

SILVER: Repeated or prolonged exposure to silver dusts may cause localized argyria.

**INGESTION:****ACUTE EXPOSURE:**

SILVER: Ingestion of silver by experimental animals was rapidly and almost completely eliminated in the feces within days.

**CHRONIC EXPOSURE:**

SILVER: No data available.

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**SECTION 12 ECOLOGICAL INFORMATION****ECOTOXICITY DATA:**

**FISH TOXICITY:** 58000 ug/L 96 hour(s) LC50 (Mortality) Sheepshead minnow (*Cyprinodon variegatus*)

**INVERTEBRATE TOXICITY:** 0.24 ug/L 48 hour(s) EC50 (Mortality) Water flea (*Daphnia magna*)

**ALGAL TOXICITY:** 70 ug/L 96 hour(s) EC50 (Photosynthesis) Diatom (*Skeletonema costatum*)

**FATE AND TRANSPORT:**

**BIOCONCENTRATION:** 10250 ug/L 14 hour(s) BCF (Residue) Pacific oyster (*Crassostrea gigas*) 20 ug/L

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**SECTION 13 DISPOSAL CONSIDERATIONS**

Hazardous Waste Number(s): D011. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 5.0 mg/L. Dispose in accordance with all applicable regulations.

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**SECTION 14 TRANSPORT INFORMATION****U.S. DOT 49 CFR 172.101:**

**PROPER SHIPPING NAME:** Metal powders, flammable, n.o.s. (silver)

**ID NUMBER:** UN3089

**HAZARD CLASS OR DIVISION:** 4.1

**PACKING GROUP:** II



**CANADIAN TRANSPORTATION OF DANGEROUS GOODS:** No classification assigned.

**LAND TRANSPORT ADR/RID:**

**PROPER SHIPPING NAME:** Metal powder, flammable, n.o.s.

**UN NUMBER:** UN3089

**ADR/RID CLASS:** 4.1

**CLASSIFICATION CODE:** F3

**PACKING GROUP:** II

**AIR TRANSPORT IATA/ICAO:**

**PROPER SHIPPING NAME:** Metal powder, flammable, n.o.s.

**UN/ID NUMBER:** UN3089

**IATA/ICAO CLASS:** 4.1

**PACKING GROUP:** II

**MARITIME TRANSPORT IMDG:**

**PROPER SHIPPING NAME:** Metal powder, flammable, n.o.s.

**UN NUMBER:** UN3089

**IMDG CLASS:** 4.1

**PACKING GROUP:** II

SECTION 15 REGULATORY INFORMATION

**U.S. REGULATIONS:**

**CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):**

**SILVER, METAL (as Ag):** 1000 LBS RQ

**SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):**

Not regulated.

**SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):**

Not regulated.

**SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):**

**ACUTE:** No

**CHRONIC:** No

**FIRE:** Yes

**REACTIVE:** No

**SUDDEN RELEASE:** No

**SARA TITLE III SECTION 313 (40 CFR 372.65):**

**SILVER, METAL (as Ag)**

**OSHA PROCESS SAFETY (29CFR1910.119):** Not regulated

**STATE REGULATIONS:**

**California Proposition 65:** Not regulated.

**CANADIAN REGULATIONS:**

**WHMIS CLASSIFICATION:** Not determined.

**EUROPEAN REGULATIONS:**

**EC CLASSIFICATION (CALCULATED):** Not determined.

**GERMAN REGULATIONS:**

**WATER HAZARD CLASS (WGK):**

**STATE OF CLASSIFICATION:** VwVwS

**CLASSIFICATION UNDER HAZARD TO WATER:** 3

**NATIONAL INVENTORY STATUS:**

**U.S. INVENTORY (TSCA):** Listed on inventory.

**TSCA 12(b) EXPORT NOTIFICATION:** Not listed.

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**SECTION 16 OTHER INFORMATION**

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**MSDS SUMMARY OF CHANGES**

**SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION**

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# MATERIAL SAFETY DATA SHEET

## SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

### MDL INFORMATION SYSTEMS, INC.

1281 Murfreesboro Road, Suite  
300

Nashville, TN 37217-2423

1-615-366-2000

### EMERGENCY TELEPHONE NUMBER

1-800-424-9300 (NORTH  
AMERICA)

1-703-527-3887  
(INTERNATIONAL)

### SUBSTANCE: THALLIUM

### TRADE NAMES/SYNONYMS:

RAMOR; THALLIUM ELEMENT; TL; OHS23180; RTECS XG3425000

### CHEMICAL FAMILY: metal

CREATION DATE: Jul 29 1988

REVISION DATE: Mar 18 2002

## SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

### COMPONENT: THALLIUM

CAS NUMBER: 7440-28-0

EC NUMBER (EINECS): 231-138-1

EC INDEX NUMBER: 081-001-00-3

PERCENTAGE: 100

## SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH= FIRE=3 REACTIVITY=0

### EMERGENCY OVERVIEW:

COLOR: white

PHYSICAL FORM: solid

ODOR: odorless

MAJOR HEALTH HAZARDS: No significant target effects reported.

PHYSICAL HAZARDS: Flammable solid. Negligible fire and explosion hazard in bulk form. Dust/air mixtures may ignite or explode.



**POTENTIAL HEALTH EFFECTS:****INHALATION:****SHORT TERM EXPOSURE:** no information on significant adverse effects**LONG TERM EXPOSURE:** no information is available**SKIN CONTACT:****SHORT TERM EXPOSURE:** same as effects reported in short term ingestion**LONG TERM EXPOSURE:** no information on significant adverse effects**EYE CONTACT:****SHORT TERM EXPOSURE:** irritation**LONG TERM EXPOSURE:** no information is available**INGESTION:****SHORT TERM EXPOSURE:** no information on significant adverse effects**LONG TERM EXPOSURE:** hair loss, kidney damage, liver damage, nerve damage**CARCINOGEN STATUS:****OSHA:** No**NTP:** No**IARC:** NoSECTION 4 FIRST AID MEASURES

**INHALATION:** If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

**SKIN CONTACT:** Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

**EYE CONTACT:** Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

**INGESTION:** Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

**ANTIDOTE:** sodium diethyldithiocarbamate, oral; diphenylthiocarbazon, oral

SECTION 5 FIRE FIGHTING MEASURES

**FIRE AND EXPLOSION HAZARDS:** Negligible fire and explosion hazard in bulk form. Dust/air mixtures may ignite or explode.

**EXTINGUISHING MEDIA:** dolomite, dry powder for metal fires, dry sand, graphite, soda ash, sodium chloride

Do not get water directly on material

**FIRE FIGHTING:** Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate

hazard area and deny entry. Let the fire burn. Use extinguishing agents appropriate for surrounding fire. Avoid inhalation of material or combustion by-products.

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## **SECTION 6**    **ACCIDENTAL RELEASE MEASURES**

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### **OCCUPATIONAL RELEASE:**

Do not touch spilled material. Stop leak if possible without personal risk. Small spills: Absorb with sand or other non-combustible material. Collect with absorbent into suitable container. Small dry spills: Collect spilled material in appropriate container for disposal. Move containers away from spill to a safe area. Large spills: Dike for later disposal. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

## **SECTION 7**    **HANDLING AND STORAGE**

**STORAGE:** Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances.

## **SECTION 8**    **EXPOSURE CONTROLS, PERSONAL PROTECTION**

### **EXPOSURE LIMITS:**

#### **THALLIUM:**

#### **THALLIUM, SOLUBLE COMPOUNDS (as TI):**

0.1 mg/m<sup>3</sup> OSHA TWA (skin)

0.1 mg/m<sup>3</sup> ACGIH TWA (skin)

0.1 mg/m<sup>3</sup> NIOSH recommended TWA 10 hour(s) (skin)

0.1 mg/m<sup>3</sup> DFG MAK (peak limitation category-III) (inhalable dust fraction)

0.1 mg/m<sup>3</sup> UK OES TWA (skin)

**MEASUREMENT METHOD:** Particulate filter; Acid; Inductively coupled plasma; NIOSH IV # 7300, Elements

**VENTILATION:** Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

**EYE PROTECTION:** Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

**CLOTHING:** Wear appropriate chemical resistant clothing.

**GLOVES:** Wear appropriate chemical resistant gloves.

**RESPIRATOR:** Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Respiratory protection is ranked in order from minimum to maximum. Consider warning properties before use.

Any dust, mist, and fume respirator.

Any air-purifying respirator with a high-efficiency particulate filter.

Any powered, air-purifying respirator with a dust, mist, and fume filter.

Any powered, air-purifying respirator with a high-efficiency particulate filter.

**For Unknown Concentrations or Immediately Dangerous to Life or Health -**

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

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## **SECTION 9**    **PHYSICAL AND CHEMICAL PROPERTIES**

**PHYSICAL STATE:** solid

**COLOR:** white

**ODOR:** odorless

**MOLECULAR WEIGHT:** 204.383

**MOLECULAR FORMULA:** TL

**BOILING POINT:** 2637-2673 F (1447-1467 C)

**MELTING POINT:** 579 F (304 C)

**VAPOR PRESSURE:** 1 mmHg @ 825 C

**VAPOR DENSITY:** Not applicable

**SPECIFIC GRAVITY (water=1):** 11.85

**WATER SOLUBILITY:** insoluble

**PH:** Not applicable

**VOLATILITY:** Not applicable

**ODOR THRESHOLD:** Not available

**EVAPORATION RATE:** Not applicable

**COEFFICIENT OF WATER/OIL DISTRIBUTION:** Not available

**SOLVENT SOLUBILITY:**

Soluble: nitric acid, sulfuric acid

Slightly Soluble: hydrochloric acid

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## **SECTION 10**    **STABILITY AND REACTIVITY**

**REACTIVITY:** Stable at normal temperatures and pressure.

**CONDITIONS TO AVOID:** Avoid generating dust. Avoid heat, flames, sparks and other sources of ignition.

**INCOMPATIBILITIES:** halogens

**THALLIUM:**

**FLUORINE:** Ignites on contact.

**HALOGENS:** Reacts.

**HAZARDOUS DECOMPOSITION:**

Thermal decomposition products: thallium

**POLYMERIZATION:** Will not polymerize.

## SECTION 11 TOXICOLOGICAL INFORMATION

### **THALLIUM:**

#### **TOXICITY DATA:**

5714 ug/kg oral-man TDLo; 4412 ug/kg unreported-man LDLo

**ACUTE TOXICITY LEVEL:** Insufficient Data.

### **HEALTH EFFECTS:**

#### **INHALATION:**

##### **ACUTE EXPOSURE:**

**THALLIUM:** No specific data available on inhalation of thallium metal. Acute inhalation poisoning from thallium compounds is reported to be rare, however if it does occur symptoms such as those described in acute ingestion may occur.

##### **CHRONIC EXPOSURE:**

**THALLIUM:** No data available.

### **SKIN CONTACT:**

#### **ACUTE EXPOSURE:**

**THALLIUM:** There is no specific data available on the local effects of thallium metal. However, systemic toxicity may occur due to skin absorption of thallium compounds and cause symptoms has detailed in acute ingestion.

##### **CHRONIC EXPOSURE:**

**THALLIUM:** If absorption occurs over an extended period, symptoms such as those described in chronic ingestion may occur.

### **EYE CONTACT:**

#### **ACUTE EXPOSURE:**

**THALLIUM:** No data available, dust may be irritating.

##### **CHRONIC EXPOSURE:**

**THALLIUM:** No data available.

### **INGESTION:**

#### **ACUTE EXPOSURE:**

**THALLIUM:** No specific data available on thallium metal. Thallium compounds are toxic and may affect the gastrointestinal, nervous, and respiratory systems, eyes, liver and kidneys.

##### **CHRONIC EXPOSURE:**

**THALLIUM:** Thallium compounds are cumulative poisons. Indications of thallium poisoning may include pigmentation of the gums and nails, mental abnormalities, alopecia, polyneuropathy, liver and kidney damage.

## SECTION 12 ECOLOGICAL INFORMATION

### **ECOTOXICITY DATA:**

**FISH TOXICITY:** 21000 ug/L 96 hour(s) LC50 (Mortality) Sheepshead minnow (Cyprinodon variegatus)

**INVERTEBRATE TOXICITY:** 10000 ug/L 96 hour(s) LC50 (Mortality) Common shrimp (Crangon crangon)

**ALGAL TOXICITY:** 130 ug/L 96 hour(s) EC50 (Population Growth) Green algae (Selenastrum capricornutum)

**ENVIRONMENTAL SUMMARY:** Moderately toxic to aquatic life.

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## **SECTION 13** DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations.

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## **SECTION 14** TRANSPORT INFORMATION

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### **U.S. DOT 49 CFR 172.101:**

**PROPER SHIPPING NAME:** Metal powders, flammable, n.o.s. (thallium)

**ID NUMBER:** UN3089

**HAZARD CLASS OR DIVISION:** 4.1

**PACKING GROUP:** II



**CANADIAN TRANSPORTATION OF DANGEROUS GOODS:** No classification assigned.

### **LAND TRANSPORT ADR/RID:**

**PROPER SHIPPING NAME:** Metal powder, flammable, n.o.s.

**UN NUMBER:** UN3089

**ADR/RID CLASS:** 4.1

**CLASSIFICATION CODE:** F3

**PACKING GROUP:** II

### **AIR TRANSPORT IATA/ICAO:**

**PROPER SHIPPING NAME:** Metal powder, flammable, n.o.s.

**UN/ID NUMBER:** UN3089

**IATA/ICAO CLASS:** 4.1

**PACKING GROUP:** II

### **MARITIME TRANSPORT IMDG:**

**PROPER SHIPPING NAME:** Metal powder, flammable, n.o.s.

**UN NUMBER:** UN3089

**IMDG CLASS:** 4.1

**PACKING GROUP:** II

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## **SECTION 15** REGULATORY INFORMATION

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### **U.S. REGULATIONS:**

**CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):**

**Thallium:** 1000 LBS RQ

**SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):**

Not regulated.

**SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):**  
Not regulated.

**SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):**  
ACUTE: No  
CHRONIC: No  
FIRE: Yes  
REACTIVE: No  
SUDDEN RELEASE: No

**SARA TITLE III SECTION 313 (40 CFR 372.65):**  
**THALLIUM, SOLUBLE COMPOUNDS (as TI)**

**OSHA PROCESS SAFETY (29CFR1910.119):** Not regulated.

**STATE REGULATIONS:**  
**California Proposition 65:** Not regulated.

**CANADIAN REGULATIONS:**  
**WHMIS CLASSIFICATION:** Not determined.

**EUROPEAN REGULATIONS:**  
**EC CLASSIFICATION (ASSIGNED):**

T+	Very Toxic
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EC Classification may be inconsistent with independently-researched data.

**DANGER/HAZARD SYMBOL:**



**EC RISK AND SAFETY PHRASES:**

R 26/28	Very toxic by inhalation and if swallowed.
R 33	Danger of cumulative effects.
R 53	May cause long-term adverse effects in the aquatic environment.
S 1/2	Keep locked-up and out of reach of children.
S 13	Keep away from food, drink and animal feedingstuffs.
S 28	After contact with skin, wash immediately with plenty of soap and water.
S 45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 61	Avoid release to the environment. Refer to special instructions/Safety data sheets.

**NATIONAL INVENTORY STATUS:**  
**U.S. INVENTORY (TSCA):** Listed on inventory

**TSCA 12(b) EXPORT NOTIFICATION:** Not listed

**SECTION 16 OTHER INFORMATION**

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# MATERIAL SAFETY DATA SHEET

## SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

### MDL INFORMATION SYSTEMS, INC.

1281 Murfreesboro Road, Suite  
300

Nashville, TN 37217-2423

1-615-366-2000

### EMERGENCY TELEPHONE NUMBER

1-800-424-9300 (NORTH  
AMERICA)

1-703-527-3887  
(INTERNATIONAL)

### SUBSTANCE: ZINC

### TRADE NAMES/SYNONYMS:

ZINC ELEMENT; ZINC METAL; ZINC DUST; ZINC POWDER; BLUE POWDER; GRANULAR  
ZINC; UN 1436; Zn; OHS25229; RTECS ZG8600000

### CHEMICAL FAMILY: metal

CREATION DATE: Mar 26 1986

REVISION DATE: Mar 18 2002

## SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

### COMPONENT: ZINC

CAS NUMBER: 7440-66-6

EC NUMBER (EINECS): 231-175-3

EC INDEX NUMBER: 030-001-00-1

PERCENTAGE: 100.0

## SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=3 REACTIVITY=1

### EMERGENCY OVERVIEW:

COLOR: white

PHYSICAL FORM: powder, solid

ODOR: odorless

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation

PHYSICAL HAZARDS: Negligible fire and explosion hazard in bulk form. Dust/air mixtures may  
ignite or explode. Extremely flammable. May ignite spontaneously on exposure to air. May react on



contact with water.

**POTENTIAL HEALTH EFFECTS:****INHALATION:**

**SHORT TERM EXPOSURE:** irritation, metal fume fever, difficulty breathing, emotional disturbances, loss of coordination

**LONG TERM EXPOSURE:** no information on significant adverse effects

**SKIN CONTACT:**

**SHORT TERM EXPOSURE:** irritation (possibly severe)

**LONG TERM EXPOSURE:** irritation

**EYE CONTACT:**

**SHORT TERM EXPOSURE:** irritation (possibly severe)

**LONG TERM EXPOSURE:** no information is available

**INGESTION:**

**SHORT TERM EXPOSURE:** fever, nausea, vomiting, diarrhea, stomach pain, dizziness, internal bleeding, kidney damage

**LONG TERM EXPOSURE:** nausea, loss of appetite, weight loss, headache, drowsiness, dizziness, pain in extremities, loss of coordination

**CARCINOGEN STATUS:**

**OSHA:** No

**NTP:** No

**IARC:** No

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**SECTION 4 FIRST AID MEASURES**

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**INHALATION:** If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

**SKIN CONTACT:** Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

**EYE CONTACT:** Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

**INGESTION:** If a large amount is swallowed, get medical attention.

**ANTIDOTE:** calcium disodium edetate/dextrose, intravenous; calcium disodium edetate/procaine, intramuscular.

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**SECTION 5 FIRE FIGHTING MEASURES**

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**FIRE AND EXPLOSION HAZARDS:** Negligible fire and explosion hazard in bulk form. Dust/air mixtures may ignite or explode. Finely divided material may ignite spontaneously. May ignite on exposure to air.

**EXTINGUISHING MEDIA:** regular dry chemical, dry sand, lime, soda ash

Do not use water or foam

**FIRE FIGHTING:** Reduce vapors with water spray. Do not get water inside container. Move container from fire area if it can be done without risk. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Use extinguishing agents appropriate for surrounding fire. Do not get water directly on material.

**LOWER FLAMMABLE LIMIT:** 0.5 g/L

## SECTION 6 ACCIDENTAL RELEASE MEASURES

### **OCCUPATIONAL RELEASE:**

Do not touch spilled material. Avoid heat, flames, sparks and other sources of ignition. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas. Small dry spills: Collect material into suitable, loosely covered container for disposal. Move containers away from spill to a safe area. Do not get water directly on material. Do not get water inside container. Dike for later disposal. Only personnel trained for the hazards of this material should perform clean up and disposal. Move undamaged containers from spill area. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

## SECTION 7 HANDLING AND STORAGE

**STORAGE:** Store and handle in accordance with all current regulations and standards. Protect from physical damage. Store in a cool, dry place. Store in a well-ventilated area. Keep separated from incompatible substances. Keep dry. Keep separated from incompatible substances.

## SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

### **EXPOSURE LIMITS:**

#### **ZINC:**

#### **ZINC OXIDE:**

- 5 mg/m<sup>3</sup> OSHA TWA (respirable dust fraction)
- 15 mg/m<sup>3</sup> OSHA TWA (total dust)
- 10 mg/m<sup>3</sup> OSHA TWA (total particulate) (vacated by 58 FR 35338, June 30, 1993)
- 5 mg/m<sup>3</sup> OSHA TWA (fume)
- 10 mg/m<sup>3</sup> OSHA STEL (fume) (vacated by 58 FR 35338, June 30, 1993)
- 10 mg/m<sup>3</sup> ACGIH TWA (particulate) (no asbestos and <1% crystalline silica)
- 5 mg/m<sup>3</sup> ACGIH TWA (fume)
- 10 mg/m<sup>3</sup> ACGIH STEL (fume)
- 5 mg/m<sup>3</sup> NIOSH recommended TWA 10 hour(s) (fume) (dust)
- 15 mg/m<sup>3</sup> NIOSH recommended ceiling (dust)
- 10 mg/m<sup>3</sup> NIOSH recommended STEL (fume)
- 1 mg/m<sup>3</sup> DFG MAK (respirable dust fraction)
- 5 mg/m<sup>3</sup> UK OES TWA (fume)
- 10 mg/m<sup>3</sup> UK OES STEL (fume)

**MEASUREMENT METHOD:** Particulate filter; X-ray diffraction spectrometry; NIOSH IV # 7502

**MEASUREMENT METHOD:** Particulate filter; Gravimetric; NIOSH III # 0600, Nuisance Dust (respirable)

**VENTILATION:** Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

**EYE PROTECTION:** Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

**CLOTHING:** Wear appropriate chemical resistant clothing.

**GLOVES:** Wear appropriate chemical resistant gloves.

**RESPIRATOR:** The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

**50 mg/m<sup>3</sup>**

Any dust, mist, and fume respirator.

Any supplied-air respirator.

**125 mg/m<sup>3</sup>**

Any supplied-air respirator operated in a continuous-flow mode.

Any powered, air-purifying respirator with a dust, mist, and fume filter.

**250 mg/m<sup>3</sup>**

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any supplied-air respirator with a tight-fitting facepiece that is operated in a continuous-flow mode.

Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter.

Any self-contained breathing apparatus with a full facepiece.

Any supplied-air respirator with a full facepiece.

**500 mg/m<sup>3</sup>**

Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode.

**Escape -**

Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter.

Any appropriate escape-type, self-contained breathing apparatus.

**For Unknown Concentrations or Immediately Dangerous to Life or Health -**

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

## SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

**PHYSICAL STATE:** solid

**APPEARANCE:** efflorescent

**COLOR:** white

**PHYSICAL FORM:** powder, solid

**ODOR:** odorless

**MOLECULAR WEIGHT:** 65.38

**MOLECULAR FORMULA:** Zn

**BOILING POINT:** 1665 F (907 C)

**MELTING POINT:** 788 F (420 C)

**VAPOR PRESSURE:** 1 mmHg @ 487 C

**VAPOR DENSITY:** Not applicable

**SPECIFIC GRAVITY (water=1):** 7.14

**WATER SOLUBILITY:** reacts

**PH:** Not applicable

**VOLATILITY:** Not applicable

**ODOR THRESHOLD:** Not available

**EVAPORATION RATE:** Not applicable

**COEFFICIENT OF WATER/OIL DISTRIBUTION:** Not available

## SECTION 10 STABILITY AND REACTIVITY

**REACTIVITY:** Finely divided material may react with water.

**CONDITIONS TO AVOID:** Avoid generating dust. Avoid heat, flames, sparks and other sources of ignition. Keep dry.

**INCOMPATIBILITIES:** acids, bases, metals, oxidizing materials, reducing agents, halo carbons, metal salts, halogens, combustible materials, amines, metal oxides

### **ZINC:**

**ACIDS:** Evolves hydrogen gas which may be ignited by the heat of the reaction

**ALKALIES:** Evolves hydrogen gas which may be ignited by the heat of the reaction.

**ALUMINUM (POWDER):** Possible ignition.

**ALUMINUM-MAGNESIUM ALLOY + RUSTED STEEL:** May spark on impact.

**AMMONIUM NITRATE:** Violent reaction or formation of explosive mixture.

**AMMONIUM SULFIDE:** May explode in a closed container.

**ARSENIC:** Incandescent reaction when heated.

**ARSENIC TRIOXIDE:** Explosive reaction on heating.

**BROMOMETHANE:** Forms flammable compounds.

**CADMIUM:** Incandescent reaction.

**CALCIUM CHLORIDE:** Evolves hydrogen gas which may be ignited by the heat of the reaction.

**CARBON DISULFIDE:** Incandescent reaction.

**CARBON TETRACHLORIDE + METHANOL:** Extremely vigorous reaction.

**CHLORATES:** Forms shock-sensitive mixtures.

**CHLORINATED RUBBER:** Violent or explosive reaction at elevated temperatures.

**CHROMIC ANHYDRIDE:** Violent reaction and possible ignition.

**COBALT HALIDE (METHANOLIC SOLUTION) + IRON PENTACARBONYL:** Violent reaction

**ETHYL ACETOACETATE + TRIBROMONEOPENTYL ALCOHOL:** May react explosively.

**HALOCARBONS:** Possible violent reaction with ignition.

**HALOGENS:** Possible ignition.

**HYDRAZINE NITRATE:** Ignites on warming.

**HYDROXYLAMINE:** May ignite or explode when heated.

**INTERHALOGENS:** Violent reaction and possible ignition.

**LEAD AZIDE:** Increased sensitivity to explosive decomposition.

**MANGANESE DICHLORIDE:** Explosive reaction when heated.

**METAL OXIDES:** Possible ignition or incandescent reaction.

**NITRIC ACID:** Incandescent reaction.

**2-NITROANISOLE + SODIUM HYDROXIDE:** Exothermic reaction.

**NITROBENZENE:** May form pyrophoric residue.

**NITRYL FLUORIDE:** Incandesces when warmed.  
**OXIDIZERS (STRONG):** Fire and explosion hazard.  
**PEROXYFORMIC ACID:** Violent explosion on contact.  
**POTASSIUM NITRATE:** Explosive reaction on heating.  
**POTASSIUM PEROXIDE:** Incandescent reaction.  
**RHODIUM HALIDES (METHANOLIC SOLUTION) + IRON PENTACARBONYL:** Violent reaction  
**RUTHENIUM HALIDES (METHANOLIC SOLUTION) + IRON PENTACARBONYL:** Violent reaction.  
**SELENIUM:** Incandescent reaction.  
**SELENINYL BROMIDE:** Ignition.  
**SILVER + ELECTROLYTES (BATTERIES):** May spontaneously combust.  
**SODIUM PEROXIDE:** Incandescent reaction.  
**SULFUR:** Violent reaction.  
**TELLURIUM:** Incandescent reaction.  
**ZINC CHLORIDE:** May increase flammability.

### **HAZARDOUS DECOMPOSITION:**

Thermal decomposition products: oxides of zinc

**POLYMERIZATION:** Will not polymerize.

## **SECTION 11 TOXICOLOGICAL INFORMATION**

### **ZINC:**

#### **IRRITATION DATA:**

300 ug/3 day(s)-intermittent skin-human mild

#### **TOXICITY DATA:**

124 mg/m<sup>3</sup>/50 minute(s) inhalation-human TCLO; 388 mg/kg oral-duck LDLo

#### **LOCAL EFFECTS:**

Irritant: inhalation, skin, eye

**ACUTE TOXICITY LEVEL:** Insufficient Data.

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** respiratory disorders, skin disorders and allergies

**ADDITIONAL DATA:** Excessive zinc intake has been associated with a copper-deficiency anemia.

### **HEALTH EFFECTS:**

#### **INHALATION:**

#### **ACUTE EXPOSURE:**

**ZINC:** Inhalation of dust may cause irritation with difficulty in breathing and sneezing. Neurological and psychiatric symptomology including irritability, upper extremity coarse intention tremor, incoordination, and ataxia have also been reported. Metal fume fever, an influenza-like illness, may occur due to the inhalation of freshly formed metal oxide particles sized below 1.5 microns and usually between 0.02-0.05 microns. Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic, or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude, and a generalized feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea, and prostration may also occur. Tolerance to fumes develops rapidly, but it is quickly lost. All symptoms usually subside within 24-36 hours.

### **CHRONIC EXPOSURE:**

**ZINC:** Severe gastrointestinal disturbances and hypochromic anemia have been reported, but other chemicals may have contributed to the effects.

**SKIN CONTACT:**

**ACUTE EXPOSURE:**

**ZINC:** Dust may cause mechanical irritation and mild dermatitis in intertriginous areas. Reaction with moisture on skin may result in serious burns.

**CHRONIC EXPOSURE:**

**ZINC:** 300 ug applied to human skin intermittently for 3 days caused mild irritation. Allergic reactions are rare, but have been reported.

**EYE CONTACT:**

**ACUTE EXPOSURE:**

**ZINC:** Dust may cause mechanical irritation or injury to the surface of the eye, with discomfort, reddening, and tearing. Direct contact may cause serious corneal burns.

**CHRONIC EXPOSURE:**

**ZINC:** No data available.

**INGESTION:**

**ACUTE EXPOSURE:**

**ZINC:** Large oral doses may cause gastrointestinal distress with stomach cramps, dehydration, electrolyte imbalance, abdominal pain, nausea, vomiting, hematemesis, diarrhea, lethargy, immune system effects, fever, dizziness, tightness in the throat, shock, collapse, renal failure, and death. Survivors may have residual nephritis and strictures of the esophagus and pyloric end of the stomach

**CHRONIC EXPOSURE:**

**ZINC:** Patients taking zinc in amounts 10 times the RDA for months and years have not shown any adverse reactions. Excessive absorption may cause copper-deficiency anemia. Ingestion of approximately 85.7 mg/kg/day for 2 days caused lethargy, lightheadedness, staggering, and difficulty in writing clearly. 2 people who ingested 40 ppm in drinking water for several months experienced lack of concentration, drowsiness, mental and physical fatigue, pain in the arms and legs, headache, stiffness, muscle pains, loss of appetite, nausea, weight loss, and lassitude. 90 ppm in the diet for 5 weeks has resulted in a decrease in the HDL cholesterol level. Pancreatic abnormalities have also been observed. A diet of 0.25% in rats caused no injury; above 0.25% there was breakdown of the homeostatic mechanism, growth retardation, hypochromic anemia, and defective mineralization of the bones. Mice fed 500 ppm for 14 months exhibited hypertrophy of the adrenal cortex and changes indicating hyperactivity of the pancreatic islets and pituitary gland; 30,000 ppm for 13 weeks caused liver and kidney damage and some deaths. Cows fed 2% for 2 days developed severe enteritis, with 7 of 40 dying. Severe pulmonary emphysema and changes in the myocardium, kidneys, and liver were observed. Pigs fed >1000 ppm had reduced food intake and weight gain; at >2000 ppm, death occurred after 2 weeks. Bone changes were observed in foals fed 5400 ppm. High dietary levels of zinc have been associated with reduced fetal weights, altered concentrations of fetal iron and copper, and alopecia and reduced growth of offspring in animals.

## **SECTION 12 ECOLOGICAL INFORMATION**

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**ECOTOXICITY DATA:**

**FISH TOXICITY:** 840 ug/L 96 hour(s) LC50 (Mortality) Banded killifish (*Fundulus diaphanus*)

**INVERTEBRATE TOXICITY:** 45.8 ug/L 72 hour(s) EC50 (Shell Valve Closure) Swan mussel

(Anodonta cygnea)

**ALGAL TOXICITY:** 65 ug/L 4 hour(s) IC50 (Population Growth) Diatom (Nitzschia closterium)

**PHYTOTOXICITY:** 10000 ug/L 4 hour(s) EC50 (Growth) Duckweed (Lemna minor)

**FATE AND TRANSPORT:**

**BIOCONCENTRATION:** 7100 uM 2 hour(s) BCFD (Residue) Duckweed (Lemna trisulca) 3.06 uM

## **SECTION 13** DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001. Dispose in accordance with all applicable regulations.

## **SECTION 14** TRANSPORT INFORMATION

**U.S. DOT 49 CFR 172.101:**

**PROPER SHIPPING NAME:** Zinc powder or Zinc dust

**ID NUMBER:** UN1436

**HAZARD CLASS OR DIVISION:** 4.3

**PACKING GROUP:** I



**CANADIAN TRANSPORTATION OF DANGEROUS GOODS:** No classification assigned

**LAND TRANSPORT ADR/RID:**

**PROPER SHIPPING NAME:** Zinc dust

**UN NUMBER:** UN1436

**ADR/RID CLASS:** 4.3

**CLASSIFICATION CODE:** WS

**PACKING GROUP:** I

**AIR TRANSPORT IATA/ICAO:**

**PROPER SHIPPING NAME:** Zinc dust

**UN/ID NUMBER:** UN1436

**IATA/ICAO CLASS:** 4.3

**PACKING GROUP:** I

**MARITIME TRANSPORT IMDG:** No classification assigned.

## **SECTION 15** REGULATORY INFORMATION

**U.S. REGULATIONS:**

**CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):**

**ZINC:** 1000 LBS RQ

**SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):**

Not regulated.

**SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):**  
Not regulated.

**SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):**

ACUTE: Yes

CHRONIC: No

FIRE: Yes

REACTIVE: Yes

SUDDEN RELEASE: No

**SARA TITLE III SECTION 313 (40 CFR 372.65):**

ZINC

**OSHA PROCESS SAFETY (29CFR1910.119):** Not regulated

**STATE REGULATIONS:**

California Proposition 65: Not regulated

**CANADIAN REGULATIONS:**

WHMIS CLASSIFICATION: Not determined

**EUROPEAN REGULATIONS:**

**EC CLASSIFICATION (ASSIGNED):**

F	Highly Flammable
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EC Classification may be inconsistent with independently-researched data

**DANGER/HAZARD SYMBOL:**



**EC RISK AND SAFETY PHRASES:**

R 15	Contact with water liberates extremely flammable gases.
R 17	Spontaneously flammable in air.
S 2	Keep out of reach of children.
S 7/8	Keep container tightly closed and dry.
S 43	In case of fire, use dry chemical, carbon dioxide, water or regular foam.

**GERMAN REGULATIONS:**

**WATER HAZARD CLASS (WGK):**

**STATE OF CLASSIFICATION:** VwVwS

**CLASSIFICATION UNDER HAZARD TO WATER:** 0

**NATIONAL INVENTORY STATUS:**

**U.S. INVENTORY (TSCA):** Listed on inventory

**TSCA 12(b) EXPORT NOTIFICATION:** Not listed

**SECTION 16 OTHER INFORMATION**

